

# SHELF ASSEMBLY, SHELF BODY, AND SHELF SUPPORT

## BACKGROUND OF THE INVENTION

### Field of the Invention

The present invention relates to shelf assemblies. Specifically, to shelf assemblies which can easily be mounted on a desired spot such as a wall, corner wall, or the like as a unit and which is excellent in stability, cohesiveness, fall prevention, aesthetics, design, and the like. The present invention also relates to shelf bodies and shelf supports.

### Description of the Related Art

Conventionally, various designs have been suggested for shelf assemblies which can be mounted on a desired spot such as a wall. For example, Japanese Patent Application Laid-Open (JP-A) No. 05-112 suggests a shelf assembly which comprises shelf-supporting members mounted on a wall and a shelf panel mounted on the shelf-supporting member, wherein the shelf-supporting member is inserted into cores of the shelf panel, wherein the cores have holes that have been drilled at the rear ends to accommodate the shelf-supporting members. JP-A No. 05-113 suggests a shelf assembly which comprises shelf-supporting members mounted on a wall and a shelf panel mounted on the shelf-supporting member, wherein the shelf-supporting members are inserted between cores of the shelf panel so that the shelf panel is slidably mounted. However,

these suggested shelves are mounted on a wall merely by inserting the shelf-supporting members into the shelf panels, either into the drilled holes or between the cores. Therefore, their performances were not at a satisfactory level with regards to strength, cohesiveness, fall prevention, aesthetics, design, and the like.

Another disclosure in JP-A No. 2001-161588 suggests a shelf assembly which includes a shelf support which is mounted on a wall of, for example, a bathroom, and a shelf body which is mounted to the shelf support from the front side of the support so as to cover the shelf support. However, in this case, the suggested shelf assembly has the shelf support and shelf body fixed together with screws and therefore the shelf assembly is not satisfactory from the standpoint of the ease of mounting, fall prevention, aesthetics, design, and the like.

On the other hand, various suggestions have been made for corner shelf assemblies that are mounted to corner walls (see JP-A No. 05-245010, JP-A No. 07-204043, and JP-A No. 10-337228). However, the suggested corner shelf assemblies are not satisfactory from the standpoint of the ease of mounting, cohesiveness, fall prevention, aesthetics, design, and the like.

Therefore the current situation is that no shelf assembly has been provided which can be mounted firmly as a unit to a desired spot such as a wall, corner wall, or the like in a simple manner and which is excellent in stability, cohesiveness, fall prevention, aesthetics, design, and the like.

## SUMMARY OF THE INVENTION

Therefore, an object of the present invention is to provide a shelf assembly which can be mounted as a unit to a desired spot such as a wall, corner wall, or the like in a simple manner, which is also excellent in stability, cohesiveness, fall prevention, aesthetics, and design, and which can suitably be used as a board shelf, L-shaped shelf, corner shelf, box-shaped shelf, and the like. It is another object of the present invention to provide a shelf body and a shelf support which form the shelf assembly.

The shelf assembly of the present invention comprises a shelf support and a shelf body mounted on the shelf support. The shelf support includes a fixing part, at least a portion of which is fixed to a desired spot, and a fall prevention part. The shelf body has a cavity which is capable of encasing the entire portion of the shelf support. Since the shelf support includes the fixing part which is fixed to a desired spot, and the fall prevention part which is inserted into the shelf body while preventing the shelf body from falling off, it is possible to mount the shelf body to the shelf support while surely preventing the shelf body from falling off without using a special mounting means. The shelf body has the cavity which can encase the shelf support, and since the shelf body is mounted to the shelf support so that the entire portion of the shelf support is encased in the cavity, no portion of the shelf support can be seen from the outside and the shelf assembly can be mounted to a wall as a unit. Therefore, the shelf assembly of the present invention has high quality and is

excellent in stability, cohesiveness, fall prevention, aesthetics, design, and the like compared to conventional shelf assemblies.

The shelf support of the present invention has a fixing part, at least a portion of which is fixed to a desired spot, and a fall prevention part which can prevent a shelf body from falling off while holding the shelf body. Since the shelf support of the present invention includes the fixing part and the fall prevention part, it is possible to mount firmly to a desired spot such as a wall, corner wall, or the like without using a special mounting means while being free from falling and possessing stability and a satisfactory mountability.

The shelf body of the present invention has a cavity which can encase the entire portion of a shelf support when the shelf body is mounted to the shelf support. Since the shelf body of the present invention includes the cavity which can encase the shelf support entirely when the shelf body is mounted to the shelf support, it is possible to mount as a unit to a desired spot such as a wall, corner wall, or the like and provide a satisfactory strength while no portion of the shelf support is seen from the outside. In particular, the shelf body is suitable for one of the aspects of board shelf body, L-shaped shelf body, corner shelf body, and box-shaped shelf body.

## BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be further understood by reading the following detailed description with reference to the accompanying drawings, in which like reference numbers and characters may be

used to designate like elements.

FIG. 1 is a perspective view showing an example of a box-shaped shelf body and an L-shaped shelf support to which the shelf body is mounted, in accordance with an embodiment of the present invention.

FIG. 2 is a perspective view of an example of an L-shaped shelf support, in accordance with an embodiment of the present invention.

FIG. 3 is a perspective view of another example of an L-shaped shelf support, in accordance with an embodiment of the present invention.

FIG. 4 is a detailed view showing an example of a protrusion of a shelf body engaged with a bent part of an L-shaped shelf support, in accordance with an embodiment of the present invention.

FIG. 5 is a perspective view showing an example of an oblong box-shaped shelf body mounted to two L-shaped shelf supports, in accordance with an embodiment of the present invention.

FIG. 6 is a perspective view showing an example of a relatively large box-shaped shelf body mounted to four L-shaped shelf supports, in accordance with an embodiment of the present invention.

FIG. 7 is a perspective view showing an example of a relatively large box-shaped shelf body mounted to two L-shaped shelf supports, in accordance with an embodiment of the present invention.

FIG. 8 is a perspective view of an example of an L-shaped shelf body, in accordance with an embodiment of the present invention.

FIG. 9 is an orthogonal view of an example of the L-shaped

shelf body of FIG. 8 showing the side of a cavity.

FIG. 10 is a perspective view showing an example of an L-shaped shelf body and an L-shaped shelf support to which the shelf body is mounted, in accordance with an embodiment of the present invention.

FIG. 11 is a perspective view showing an example of a board shelf body and a U-shaped shelf support to which the shelf body is mounted, in accordance with an embodiment of the present invention.

FIG. 12 is a perspective view of an example of a U-shaped shelf support, in accordance with an embodiment of the present invention.

FIG. 13 is a perspective view of an example of another U-shaped shelf support, in accordance with an embodiment of the present invention.

FIG. 14 is a perspective view showing an example of a board shelf body and a U-shaped shelf support to which the shelf body is mounted, in accordance with an embodiment of the present invention.

FIG. 15 is a perspective view showing an example of a board shelf body and a pair of hooked shelf supports to which the shelf body is mounted, in accordance with an embodiment of the present invention.

FIG. 16 is a perspective view of an example of one of the hooked shelf supports of FIG. 15.

FIG. 17 is a perspective view of an example of a corner shelf body, in accordance with an embodiment of the present invention.

FIG. 18 is a schematic sectional view of an example of the corner

shelf body of FIG. 17 taken at the sectioning plane indicated by line 18 – 18.

FIG. 19 is a perspective view of another example of a corner shelf body, in accordance with an embodiment of the present invention.

FIG. 20 is a schematic sectional view of an example of the corner shelf body of FIG. 19 taken at the sectioning plane indicated by line 20 – 20.

FIG. 21 is a perspective view of an example of a V-shaped shelf support for fixing a corner shelf body, in accordance with an embodiment of the present invention.

FIG. 22A is a perspective view showing an example of a corner shelf body and a V-shaped shelf support to which the shelf body is mounted, in accordance with an embodiment of the present invention.

FIG. 22B is a perspective view showing an example of the corner shelf body of FIG. 20A mounted on the V-shaped shelf support of FIG. 20A.

FIG. 23 is a detailed sectional view showing an example of a protrusion of a corner shelf body and a fall prevention part of a V-shaped shelf support with which the protrusion is engaged, in accordance with an embodiment of the present invention.

FIG. 24 is a bottom side view of an example of a portion of a V-shaped shelf support showing hinges between a fall prevention part and two fixing parts, in accordance with an embodiment of the present invention.

FIG. 25 is an enlarged view of an example of a portion of the V-shaped shelf support of FIG. 21, the portion indicated by a circle W, showing a hinge having two thin parts, in accordance with an embodiment of the present invention.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

### Shelf Assembly

The shelf assembly of the present invention comprises a shelf support, a shelf body, and other members if necessary.

### Shelf Support

The shelf support comprises a fixing part, a fall prevention part, and if necessary, an arm, a hinge, and other members. It is of note that the shelf support may be referred to as a shelf body mounting member or a bracket. In addition, it should be noted that in this specification, an arm is a projecting body which extends, projects, or juts out, up, forward, or in any other direction, regardless of its length.

The shelf support is mounted to a desired spot by the fixing part. The spot to which the shelf support is mounted is not particularly limited, and may be selected according to the purpose. The shelf support can be mounted to, for example, a wall, corner wall, floor, ceiling, pillar, door, or the like. Among these, a wall and a corner wall are particularly preferred. The wall or corner wall to which the shelf support is mounted may be located, for example, inside a house such as in a bathroom, lavatory, hall, entrance, wardrobe, closet, study, living room, bedroom, kitchen, and the like,



or outside the house as an outer wall.

Materials of the wall and corner walls to which the shelf support is mounted are not particularly limited, and may be selected according to the purpose. Examples of the materials include iron (used in partition walls), wood, gypsum, concrete, tiles, and the like.

The shelf support is not limited in terms of its shape, structure, size (length and/or width), material, and the like, as long as it has capability to fix the shelf body to a desired spot, and it may be selected according to the purpose. For example, (1) if the desired spot is a wall, it is preferred that the fixing part be formed substantially straight, and the straight fixing part comprise arms at both ends. Since this shelf support has a fixing part and arms arranged in a shape resembling the letter "U," it may be referred to as a "U-shaped shelf support."

The U-shaped shelf support may be cut in half at about the middle of the straight fixing part so as to form two separate hooked shelf supports. The U-shaped shelf support and hooked shelf supports are suitable for mounting a relatively small board shelf body.

Moreover, (2) if the desired spot is a wall, it is also preferred that the fixing part be formed in a shape resembling the letter "L," and the L-shaped fixing part comprise arms at both ends. Since this shelf support has a fixing part and arms arranged in a shape resembling the letter "L," it may be referred to as an "L-shaped shelf support."

The L-shaped shelf support is suitable for mounting a box-shaped shelf body, and by using two or more L-shaped shelf

supports, it is possible to mount a relatively large box.

In addition, (3) if the desired spot is a corner wall, it is preferred that the shelf support comprise two fixing parts and a fall prevention part arranged between the two fixing parts. Since this shelf support has two fixing parts and a fall prevention part arranged in a shape resembling the letter "V," it may be referred to as a "V-shaped shelf support."

The V-shaped shelf support is suitable for mounting, for example, a corner shelf body.

Preferably, the fixing part of the shelf support, especially for the U-shaped shelf support and L-shaped shelf support, includes a bent part arranged on at least one side of the fixing part along the length of the fixing part. The bent part can be engaged with a protrusion arranged at an inner edge of a cavity of a shelf body. When the bent part and the protrusion are engaged, a pulling effect works on the shelf body pulling it towards the wall. Therefore, it is advantageous in that the cohesiveness and stability of the shelf support and the shelf body improve.

The fall prevention part is not particularly limited as long as it is capable of holding a shelf body while preventing it from falling off when the shelf body is mounted on the shelf support, and may be selected according to the purpose. For example, (1) if the shelf support is a U-shaped shelf support or an L-shaped shelf support, the fall prevention part is preferably arranged on an arm which projects from a fixing part of the shelf support. The fall prevention part has a

leaf spring structure which is angled outward. The advantage of the fall prevention part having the leaf spring structure is that when the shelf body is mounted onto the shelf support, the fall prevention part spreads toward outside and presses the inner wall of the shelf body in the cavity so that it holds the shelf body while preventing the shelf body from falling off.

Preferably, the portion of the fall prevention part arranged on the arm which touches a side wall of the shelf body is covered with an elastic material such as rubber. Alternatively, the entire portion of the arm may be covered with an elastic material such as rubber. If the fall prevention part is covered with an elastic material, it is advantageous in that the cover will reduce the impact and improve the fall preventing effect.

Moreover, (2) if the shelf support is a V-shaped shelf support, it preferably comprises two fixing parts and a fall prevention part arranged between the two fixing parts, and when the fixing parts of the shelf supports are fixed to a corner wall, it is preferable that the fall prevention part be positioned at the corner portion of the corner wall (corner point). In this case, if a corner guide is arranged at the rear end of the fall prevention part, it is advantageous in that the fall prevention part is guided so that it is positioned at the corner point and that therefore misplacement at mounting the shelf support can be prevented.

For each of the two fixing parts, one of the ends is connected to the fall prevention part with a hinge, in which the other end of the

fixing part is configured so that it is rotatable about the hinge. Preferably, the hinge comprises at least one thin part, and more preferably one to two thin parts. If the shelf support has the hinges including the thin parts between each of the fixing parts and the fall prevention part, the two fixing parts become freely bendable, and it is therefore possible to mount the shelf support easily to a desired spot without a gap even if the desired spot is one of corner walls having various angles by freely adjusting the angle formed by the two fixing parts. In this case, the angle that is formed by the two fixing parts is not particularly limited, and can suitably be adjusted to conform to the angle of the corner wall to which the shelf support is mounted. For example, even if a shelf support is manufactured or molded with the angle formed by two fixing parts of  $180^\circ$  (the overall shape being straight), the angle can freely be changed within a range of about  $50^\circ$  to about  $180^\circ$  when being used. This is advantageous in that making a mold of the shelf support is simple because it is straight and therefore the efficiency of molding cycle is high.

The fall prevention part may include a shelf body-guiding surface which is slanted upward to guide the upper part of the inner wall of the shelf body in the cavity of the shelf body. If the fall prevention part has a shelf body-guiding surface, it is advantageous in that a shelf body can be mounted to the shelf support smoothly.

The shelf support can be selected according to the type, shape, size (width and length), and the like of the shelf body to be mounted, and for example, one or more of U-shaped shelf supports, L-shaped

supports, V-shaped supports, and hooked shelf supports may be used either alone or in combination.

The method to fix the shelf support to a desired spot such as a wall, corner wall, or the like is not particularly limited, and may be suitably selected according to the purpose. Examples of the method include fixing with fasteners such as nails, drawing pins, pushpins, screws, and the like, fixing with various anchors, fixing using these means in combination, and the like.

The material of the shelf support is not particularly limited, and may be selected from well known materials according to the purpose. Examples include metal materials such as iron, aluminum, stainless steel and the like; synthetic resins such as polycarbonate, poly vinyl chloride, polypropylene, acrylonitrile butadiene styrene resin, and the like; and other materials.

If a metal material is used as the material of the shelf support, a shelf assembly having an ample strength can be made.

If a synthetic resin is used as the material of the shelf support, it is possible to mold the shelf support even if it contains an arm or a fall prevention part with a complicated shape, and a large scale production is possible using a mold.

--Shelf Body --

The shelf body comprises a cavity which can encase the shelf support and, if necessary, a protrusion and other members.

Since the shelf body is mounted on the shelf support as the cavity encases the entire shelf support, the shelf support cannot be

visually recognized from the outside when the shelf body is mounted, providing an excellent aesthetics and design.

The size (width, length, and the like), structure, shape, and the like of the cavity of the shelf body may be different according to the shape, type, usage, and the like of the shelf body, and can suitably be selected according to the purpose. For example, it is preferable that the size of the cavity be determined according to the shape of the shelf body so that the shelf body has an ample strength.

For a corner shelf body, it is preferable that the shape of the cavity be formed so that the width of the cavity decreases gradually toward the direction in which the corner shelf body is mounted. If the shape of the cavity is formed so that the width of the cavity decreases gradually, it is advantageous in that cohesiveness and mountability of the corner shelf body to the shelf support can be improved.

Moreover, it is preferable that a corner shelf body has a rib arranged in the cavity. The rib is not particularly limited with regards to the size (width, length, or the like), shape, number, structure, position where it is arranged, and the like, and they may be determined according to the purpose. If a corner shelf body has a rib, the corner shelf body can be mounted on a shelf support firmly and stably, and the strength of the corner shelf assembly will improve.

It is preferable that a protrusion be formed in an inner edge of the cavity of the shelf body. The number, shape, structure, size, and the like of the protrusion is not limited, and can suitably be selected

according to the purpose, but for example, the number of the protrusions is preferably one or more, and more preferably about 2 to 4. The shape of the protrusion is preferably formed, for example, into at least one of a straight line, a curved line, and a dot. As a result, the protrusion can engage with the bent part or the fall prevention part of the fixing part in such way as line to line, line to dot, curved line to dot, or the like.

The aspects in which the shelf support is mounted on the shelf body is not particularly limited, and can suitably be selected according to the purpose, but the following aspects (1) to (3) are preferable.

(1) If the fixing part of the shelf support is substantially straight, that is, if the shelf support is a U-shaped shelf support, protrusions are preferably arranged close to the ends of the fixing part than at the center of the fixing part. As a result, the bent part, which is bent along the length of the fixing part, and the protrusions engage with each other so that it is possible to mount the shelf body firmly on the shelf support. By arranging the protrusions close to the ends than at the center of the fixing part of the shelf support, a pulling effect which pulls the shelf body toward the wall is developed, which enables firm mounting of the shelf body on the wall.

(2) If the fixing part of the shelf support is substantially of the shape of the letter "L," that is, if the shelf support is an L-shaped shelf support, protrusions are preferably arranged between a corner portion and one end of the fixing part, close to the corner portion, and between the corner portion and another end of the fixing part, close to the corner

portion. As a result, the bent part, which is bent along the length of the fixing part, and the protrusions engage with each other so that it is possible to mount the shelf body firmly on the shelf support. By arranging the protrusions between the corner portion and one end of the fixing part of the shelf support, close to the corner portion, and between the corner portion and another end, close to the corner portion, a pulling effect which pulls the shelf body toward the wall is developed, which enables firm mounting of the shelf body on the wall.

(3) For a V-shaped shelf support, in which the shelf support includes two fixing parts and a fall prevention part arranged between the two fixing parts, an engaging region comprising an edge which can engage with a protrusion of a corner shelf body is formed between the fall prevention part and a corner wall when the V-shaped shelf support is fixed to the corner wall. In such case, as the corner shelf body is mounted onto the shelf support and the protrusion is placed in the engaging region, the protrusion of the corner shelf body and the fall prevention part engage with each other so that the shelf body is mounted securely conforming to the conditions of the corner wall. In addition, since the protrusion is in contact with the fall prevention part when the corner shelf body is mounted, the effect of fall prevention is exercised favorably. Moreover, in such case when an angle of a corner wall is made slightly different from the design at the time of building or after being built, it is possible to mount the corner shelf assembly to the corner wall securely without sacrificing strength by mounting the shelf support to the corner wall without any gap.



Additionally, by molding corner shelf bodies having various angles (for example, 90°, 105°, 120°, and the like), it is possible to select and use a suitable corner shelf body according to the angle of a corner wall to which it is mounted.

The type of the shelf body is not particularly limited, and may be selected according to the purpose. Examples include a board shelf body, L-shaped shelf body, corner shelf body, box-shaped shelf body, or the like.

The board shelf body, when mounted to a wall, can hold various items. Partitioned shelf bodies of various shapes may be used as a board shelf body. The partitioned shelf body may be angled, for example, horizontally, vertically, or in any direction relative to a floor, giving a high value as an interior decoration.

The L-shaped shelf body can be mounted to a wall in various angles, being excellent in design. For example, if the angle of the L-shaped shelf body is reduced so that the shelf body resembles the letter “V” and then the shelf body is mounted to a wall, the “V” portion can hold books and magazines, giving an excellent design.

The corner shelf body provides an effective use of corner spaces in, for example, a room, bathroom, or the like, by mounting it on a corner wall.

The box-shaped shelf body can hold various items in a space resembling a box which is formed when the shelf body is mounted to a wall, giving high capacity and convenience. Additionally, by mounting the box-shaped shelf body slanted at an angle on a wall, it

can hold books and magazines without a bookend. Moreover, an oblong box-shaped shelf body and relatively large box-shaped shelf body have high capacity. Further, the box-shaped shelf body may comprise, if necessary, a door at the front opening.

The material of the shelf body is not particularly limited, and may be selected from well known materials according to the purpose. Suitable examples include synthetic resins such as polycarbonate, poly vinyl chloride, polypropylene, acrylonitrile butadiene styrene resin, and the like; metals such as iron, aluminum, stainless steel and the like; wood such as plywood, solid wood, laminated wood, and the like; and other materials.

The process for manufacturing the shelf body is not particularly limited, and can suitably be selected from well known processes according to the purpose. For example, if the shelf body is made of a synthetic resin, it is possible to produce the shelf body effectively by injection molding using a mold.

With regards to additional features, the shelf body is not particularly limited and it can suitably be selected according to the purpose. For example, the surface of the shelf body may be painted, patterned, or designed with bumps and dents, or the shelf body itself may be bent so that the design and aesthetics can be enhanced further. It is preferable to conduct various treatment to the shelf body such as water repellent treatment, antibacterial treatment, insect repellent treatment, deodorization treatment, fragrance treatment, or the like so as to give antibacterial effect, insect repellent effect, deodorizing effect,

dehumidifying effect, fragrance effect, or the like.

The water repellent treatment, antibacterial treatment, insect repellent effect, deodorizing treatment, and fragrance treatment are not particularly limited, and they may suitably be selected from well known methods according to the purpose. For example, a solution containing a water repellent agent, antibacterial agent, antifungus agent, insect repellent agent, deodorizing agent, or fragrance agent may be applied, or alternatively, these agents may be kneaded into the resin which is molded into a shelf body.

Specifically, a suitable amount of cinnamon, clove, oregano, thyme, sage, basil, rosemary, lavender, or a combination of these herbs may be finely grinded (finely grinded herb) or used to extract essential oil from it, and then the grinded herb or essential oil is included in a molding resin which is molded into a shelf body. It is also possible to apply a solution containing grinded herb or herbs or essential oil of herb or herbs to the surface of a shelf body. Further, if charcoal such as Binchou charcoal, or a material such as activated charcoal, zeolite, or the like is included or adhered to the shelf body, an excellent deodorizing effect is given. A shelf body which includes an antibacterial agent or antifungus agent or has them adhered on it is suitable for places where much water is used, such as bathroom, lavatory, kitchen, and the like.

Hereafter, several embodiments of the present invention will be described in detail referring to drawings, but it is to be understood that the scope of the present invention is not limited by these

embodiments.

(Example 1)

An example of the shelf assembly of the present invention comprising a shelf support and a shelf body will be described. The example encompasses box-shaped shelf assemblies of various sizes and shapes.

FIG. 1 is a view showing an example of a box-shaped shelf assembly 100 in accordance with Example 1 of the present invention. The box-shaped shelf assembly 100 comprises a box-shaped shelf body 20 the cross section of which is square, and an L-shaped shelf support 10 which is encased in a cavity 25 of the box-shaped shelf body 20.

The box-shaped shelf assembly 100 is mounted on a wall (not shown) by the L-shaped shelf support 10 which is fixed to the wall with screws through mounting holes 7 of the shelf support. It should be noted that although there are three mounting holes 7, each separated from one another by a predetermined length, in a fixing part 3 of the L-shaped shelf support of FIG. 1, more mounting holes may be made.

The box-shaped shelf body, which forms a box-shaped space with a wall when mounted on the wall, can hold various items.

The cavity 25 of the box-shaped shelf body 20 is formed in such a size and shape that the L-shaped shelf support 10 can be inserted smoothly and covered entirely. As a result, the shelf support does not stick out from the shelf body when the shelf body is mounted on the shelf support, providing excellent aesthetics and design.

For the box-shaped shelf body of Example 1, a polypropylene resin is used.

As shown in FIGs. 1 and 2, The L-shaped shelf support 10 comprises an L-shaped fixing part 3 and arms 5 as a unit, the arms projecting from both ends of the fixing part 3. The front ends of the arms 5 are formed to resemble the letter "C," and fall prevention parts 6 having a leaf spring structure which is angled toward outside is formed. As a result, the fall prevention parts of the shelf support press the walls of the shelf body when the shelf body is mounted on the shelf support so that the shelf body and the shelf support are firmly cohered. The shelf support 10 as shown in FIGs. 1 and 2 is made iron and has an ample strength.

As shown in FIG. 3, the tips of the fall prevention parts 6 of the L-shaped shelf support may be bent at an angle of about 90° relative to the fall prevention parts 6 to form bent tips 6b. When the shelf body is mounted, the bent tips 6b touch the bottom of the cavity of the shelf body, thereby improving the stability. The angle, shape, size, and the like of the bent tip 6b may be selected suitably. The L-shaped shelf support 10 in FIG. 3 is made of a synthetic resin, which has an excellent moldability.

The upper sides of the fixing part 3 of the L-shaped shelf support 10 are bent along their length to form bent parts 3a. On the other hand, protrusions 27 are formed, each separated from one another at predetermined lengths, at the inner edges of the cavity 25 of the shelf body. As a result, as shown in FIG. 4, the bent parts 3a and

protrusions 27 engage when the shelf body 20 is mounted on the L-shaped shelf support 10, and the pulling effect pulls the shelf body toward the wall, thereby enabling stable and secure mounting of the shelf body. In this case, as shown in FIG. 4, the angle at which the bent parts 3a and the protrusions 27 engage is preferably in a range of from 30° to 45°. If the engaging angle is from 30° to 45°, it becomes easy to attach and detach the shelf body to and from the shelf support, and the bite effect of the shelf support and the shelf body (the engaging effect and fall prevention effect) is favorably utilized.

Now, an example of the way to mount the box-shaped shelf assembly 100 shown in FIG. 1 will be described.

First, the fixing part 3 of the L-shaped shelf support 10 is fixed onto a wall (not shown) using nails, screws, or the like. By doing so, the arms 5 are fixed on the wall in a way that they project perpendicularly from the wall from both ends of the L-shaped shelf support. Then, the cavity 25 of the box-shaped shelf body 10 is mounted to the L-shaped shelf support in the direction indicated by the arrows in FIG. 1. Since the fall prevention parts 6 which are arranged at the tips of the arms have the leaf spring structure and are angled outward, they press inner walls of the box-shaped shelf body in the cavity so that the shelf support and the box-shaped shelf body are attached firmly, thereby surely preventing the box-shaped shelf body from falling off. In addition, since the shelf support is entirely encased in the cavity of the box-shaped shelf body when the shelf body is mounted, the shelf support is not seen from the outside and

therefore the box-shaped shelf assembly can be mounted easily on the wall with excellent aesthetics and design.

The size, shape, structure, and the like of the box-shaped shelf assembly are not particularly limited, and they can suitably be selected according to the purpose. For example, various shelf assemblies including an oblong box-shaped shelf assembly shown in FIG. 5, a relatively large box-shaped shelf assembly shown in FIGs. 6 and 7, and an L-shaped shelf assembly, can be used, all of which can be mounted on a wall using the L-shaped shelf supports.

For example, FIG. 5 is a perspective view of the oblong box-shaped shelf assembly 100 mounted on a wall (not shown) in accordance with an example. The oblong box-shaped shelf body 30 shown in FIG. 5 is mounted on two L-shaped shelf supports 10 at both ends of the box-shaped shelf body, the shelf supports being fixed on the wall. In this case, it is preferable to arrange partitions 35 in the cavity of the box-shaped shelf body 30 so that the partitions are in contact with fall prevention parts of the shelf supports because the cohesiveness of the shelf body can be enhanced.

When the oblong box-shaped shelf body 30 is mounted to the L-shaped shelf supports 10, the bent part of the L-shaped shelf support and the protrusions of the shelf body engage and the effect of pulling the shelf body toward the wall is developed, and thus the oblong box-shaped shelf body can be mounted firmly and stably.

In another example, FIG. 6 is a perspective view of the relatively large box-shaped shelf assembly 100 mounted on a wall (not

shown) in accordance with an example. The relatively large box-shaped shelf body 40 shown in FIG. 6 is mounted on four L-shaped shelf supports 10 at four corners of the box-shaped shelf body, the shelf supports being fixed on the wall. In this case, it is preferable to arrange partitions 45 in the cavity 25 of the box-shaped shelf body 40 so that the partitions are in contact with fall prevention parts of the shelf supports because the cohesiveness of the shelf body can be enhanced.

When the relatively large box-shaped shelf body 40 is mounted to the L-shaped shelf supports 10, as shown in FIG. 6, the bent part of the L-shaped shelf support and the protrusions of the shelf body engage and the effect of pulling the shelf body toward the wall is developed, and thus the relatively large box-shaped shelf body can be mounted firmly and stably.

In yet another example, FIG. 7 is a perspective view of the relatively large box-shaped shelf assembly 100 mounted on a wall (not shown) in accordance with an example. The relatively large box-shaped shelf body 40 shown in FIG. 7 is mounted on two L-shaped shelf supports 10 at two opposite corners of the box-shaped shelf body, the shelf supports being fixed on the wall. In this case, it is preferable to arrange partitions 45 in the cavity 25 of the box-shaped shelf body 40 so that the partitions are in contact with fall prevention parts of the shelf supports because the cohesiveness of the shelf body can be enhanced.

When the relatively large box-shaped shelf body 40 is mounted



to the L-shaped shelf supports 10, as shown in FIG. 7, the bent part of the L-shaped shelf support and the protrusions of the shelf body engage and the effect of pulling the shelf body toward the wall is developed, and thus the relatively large box-shaped shelf body can be mounted firmly and stably.

In another example, FIG. 8 is a perspective view of the L-shaped shelf assembly 150. FIG. 9 is an orthogonal view of an L-shaped shelf body 50 showing the side of a cavity 25. FIG. 10 is a perspective view showing the L-shaped shelf body 50 and an L-shaped shelf support 10 to which the shelf body is mounted. It is to be understood that although the L-shaped shelf support is positioned like an upside-down "L" in FIGs. 8 to 10, there should be no problem by positioning the shelf support like the regular "L."

The L-shaped shelf assembly 150 may be mounted on a wall (not shown) using one L-shaped shelf support 10.

When the L-shaped shelf body 50 is mounted to the L-shaped shelf support 10 the bent parts of the L-shaped shelf support and protrusions 27 of the shelf body engage and the effect of pulling the shelf body toward the wall is developed, and thus the L-shaped shelf body can be mounted firmly and stably with one L-shaped shelf support.

(Example 2)

Another example of the shelf assembly of the present invention comprising a shelf support and shelf body will be described with reference to the drawings. The example encompasses board shelf

assemblies.

FIG. 11 is a view showing an example of a board shelf assembly 200 in accordance with Example 2 of the present invention. The board shelf assembly 200 comprises a board shelf body 60 the cross section of which is rectangular, and a U-shaped shelf support 11 which is encased in a cavity 25 of the board shelf body.

The board shelf assembly 200 is mounted on a wall (not shown) by one U-shaped shelf support 11 which is fixed with screws on the wall through mounting holes 7.

As shown in FIG. 12, the U-shaped shelf support 11 has a straight fixing part 3 and arms 5 projecting from both ends of the fixing part 3. The front ends of the arms 5 are formed to resemble the letter "C," and fall prevention parts 6 having a leaf spring structure which is angled toward outside are formed. Since the shelf support 11 has the fall prevention parts which have the leaf spring structure angled toward outside, the fall prevention parts of the shelf support press walls of the shelf body when the shelf body is mounted on the shelf support so that the shelf body and the shelf support are firmly attached. The U-shaped shelf support 11, as shown in FIG. 12, is made of iron and has an ample strength.

Referring to FIG. 11, at the inner edge of the cavity 25 of the board shelf body 60, protrusions 67 are formed, each separated from one another at a predetermined length. On the other hand, as shown in FIG. 12, the upper side of the fixing part 3 of the U-shaped shelf support 11 is bent along its length to form a bent part 3a. As a result,

the protrusions 27 and bent part 3a engage when the board shelf body 60 is mounted on the U-shaped shelf support 11, and the pulling effect pulls the shelf body toward the wall, thereby enabling stable and secure mounting of the shelf body. The U-shaped shelf support shown in FIGs. 11 and 12 is made of iron and has an ample strength.

Moreover, in the U-shaped shelf support, as shown in FIG. 13, each tip of the fall prevention parts 6 of the arms which project from both ends of the straight fixing part may be bent at an angle of about 90° relative to its respective fall prevention part 6 to form bent tips 6b. When the shelf body is mounted to the shelf support, the bent tips 6b touch the bottom of the cavity of the shelf body, thereby enabling a stable mounting. The U-shaped shelf support 11 in FIG. 13 is made of a synthetic resin, which has an excellent moldability.

Referring now to FIG. 14, when the board shelf body 60 is mounted on a wall using the U-shaped shelf support 11, salient parts 65 may be made at the lower portion of the straight fixing part 3 and receiving parts 65a which engage with the salient parts 65 may be formed on the board shelf body 60. As a result, the entire portion of the U-shaped shelf support including the salient parts is encased in the cavity when the shelf body is mounted on the shelf support, and therefore the aesthetics and design are not hindered. By arranging mounting holes 7 of the fixing part at the upper portion of the fixing part of the shelf support, the shelf assembly can hold a relatively heavy item.

In Example 2, a U-shaped shelf support made of iron is

preferably used. A polypropylene resin is used for the board shelf body.

Now, an example of the way to mount the board shelf assembly 200 shown in FIG. 11 will be described. First, the fixing part 3 of the U-shaped shelf support 11 is fixed onto a wall (not shown) using nails, screws, or the like. By doing so, the arms 5 are fixed on the wall in a way that they project perpendicularly from the wall from both ends of the U-shaped shelf support. Then, the cavity 25 of the board shelf body 60 is mounted to the U-shaped shelf support in the direction indicated by the arrows in FIG. 11. Since the fall prevention parts 6 which are arranged at the tips of the arms 5 have the leaf spring structure and are angled outward, they press inner walls of the board shelf body in the cavity so that the U-shaped shelf support and the board shelf body are attached firmly, thereby surely preventing the board shelf body from falling off. In addition, since the shelf support is entirely encased in the cavity of the board shelf body when the shelf body is mounted, the shelf support is not seen from the outside and therefore the board shelf assembly can be mounted easily on the wall with excellent aesthetics and design.

Next, FIG. 15 is a view showing another example of the board shelf assembly 200 of the Example 2 of the present invention. The board shelf assembly 200 has a board shelf body 60 the cross section of which is rectangular and a pair of hooked shelf supports 12 which are entirely encased in a cavity 25 of the board shelf body.

The board shelf assembly 200 is mounted on a wall (not shown)

by the pair of hooked shelf supports 12 which are fixed on the wall through mounting holes 7 with screws. Two mounting holes 7 are formed for each shelf support to improve the stability upon mounting.

As shown in FIG. 16, the hooked shelf support 12 has a straight fixing part 3 and an arm 5 as a unit, the arm projecting from one edge of the fixing part 3. The front end of the arm 5 is formed to resemble the letter "C," and a fall prevention part 6 having a leaf spring structure which is angled toward outside is formed. With this leaf spring structure, force is applied toward the outside, pressing a wall of the shelf body so that the shelf body and the shelf supports are firmly attached.

Referring to FIG. 15, at the inner edge of the cavity 25 of the board shelf body 60, protrusions 67 are formed, each separated from one another at a predetermined length. On the other hand, as shown in FIGs. 15 and 16, the upper sides of the fixing parts 3 of the hooked shelf supports 12 are bent along the length of the fixing parts to form bent parts 3a. As a result, the protrusions 67 and bent parts 3a engage when the board shelf body 60 is mounted on the hooked shelf supports 12, and the pulling effect pulls the shelf body toward the wall, thereby enabling stable and secure mounting of the shelf body.

The hooked shelf supports 12 may be produced efficiently by, for example, cutting the fixing part 3 of a U-shaped shelf support.

Further, the hooked shelf support 12 may be used alone, or two or more may be used in combination. Moreover, it may be used in combination with the L-shaped shelf supports or U-shaped shelf

supports for partitions, various shelf assemblies of special shapes, or the like.

Now, an example of the way to mount the board shelf assembly 200 shown in FIG. 15 will be described. First, a pair of fixing parts 3 of the hooked shelf supports 12 are fixed onto a wall (not shown) using nails, screws, or the like. By doing so, the arms 5 are fixed on the wall in a way that they project perpendicularly from the wall from one end of each hooked shelf supports. Then, the cavity 25 of the board shelf body 60 is mounted to the hooked shelf supports 12 in the direction indicated by the arrows in FIG. 15. Since the fall prevention parts 6 which are arranged at the tips of the arms 5 have the leaf spring structure and are angled outward, they press inner walls of the board shelf body in the cavity so that the hooked shelf supports and the board shelf body are attached firmly, thereby surely preventing the board shelf body from falling off. In addition, since the shelf supports are entirely encased in the cavity of the board shelf body when the shelf body is mounted, the shelf supports are not seen from the outside and therefore the board shelf assembly can be mounted easily on the wall with excellent aesthetics and design.

#### (Example 3)

Another example of the shelf assembly of the present invention comprising a shelf support and shelf body will be described with reference to the drawings. The example encompasses corner shelf assemblies.

FIG. 17 is a perspective view showing a corner shelf body in

accordance with Example 3 of the present invention. FIG. 18 is a schematic sectional view of the corner shelf body of FIG. 17 taken at the sectioning plane indicated by line 18 - 18. FIG. 21 is a perspective view of a V-shaped shelf support in accordance with Example 3.

This corner shelf assembly 300 as shown in FIGs. 20A and 20B comprises a corner shelf body 70 and a V-shaped shelf support 13 which is encased entirely in the cavity 25 of the corner shelf body 70.

The corner shelf assembly 300 is mounted on a corner wall (not shown) by the V-shaped shelf support which is fixed on the corner wall through mounting holes with screws.

As shown in FIG. 21, the V-shaped shelf support 13 has two fixing parts 3 and a fall prevention part 6 between the two fixing parts. The fall prevention part 6 is formed so that when the fixing parts of the shelf support are fixed on a corner wall, it is positioned at a corner portion of the corner wall. In this case, since a corner guide 15 is arranged at the rear end of the fall prevention part 6 as shown in FIGs. 22A and 22B, the fall prevention part is guided so that it is positioned at the corner portion of the corner wall and therefore the misplacement of the shelf support does not happen at mounting and the shelf body is securely mounted.

As shown in FIG. 24, each of the two fixing parts 3 of the V-shaped shelf support is connected to the fall prevention part 6 by a hinge 9 at one end, and the other end of each fixing part 3 is rotatable about the hinge 9. As shown in FIG. 24 as an example, the hinge 9 preferably comprises a thin part 8 between the fixing part 3 and the

fall prevention part 6. Moreover, if the hinge 9 comprises two thin parts 8 between the fixing part 3 and the fall prevention part 6, as shown in FIG. 25, the bendability of the hinge can be enhanced.

Since the hinges, which comprise the thin parts 8, are formed between the two fixing parts and the fall prevention part in the V-shaped shelf support as shown in FIG. 24, if, for example, the V-shaped shelf support is molded so that the angle  $\theta$  formed by the two fixing parts is  $90^\circ$ , the angle can be changed within a range of from  $58^\circ$  to  $125.9^\circ$  and therefore even if a desired spot is one of corner walls having various angles, it is possible to adjust the angle  $\theta$ , which is formed by the two fixing parts, so as to mount the shelf support to the corner wall securely without a gap.

As shown in FIG. 18, the cavity 25 of the corner shelf body 70 is formed so that the width gradually decreases toward the front, thereby enabling the corner shelf body to be mounted on the shelf support firmly and stably.

As shown in FIGs. 19 and 20, two ribs 75 are arranged in the cavity 25 of the corner shelf body 70. With the ribs, the corner shelf body can be mounted on a shelf support firmly and stably, and the strength of the corner shelf assembly will improve.

If two ribs 75 are arranged so that they are symmetric about the broken center line 20 - 20 of the fan-shaped corner shelf body 70, as shown in FIG. 19, it is preferable that the space between the two ribs 75 be designed larger than the length of the protrusion 77 because pulling out a shaped shelf body from a mold will be easy.



Referring to FIGs. 18 and 23, at the inner edge of the cavity 25 of the corner shelf body 70, a protrusion 77 is formed. When the two fixing parts of the V-shaped shelf support is fixed on a corner wall 81, the fall prevention part 6 provides an edge between the fall prevention part 6 and the corner wall 81 which can engage with the protrusion 77 of the corner shelf body, forming an engaging region 80 as shown in FIG. 23. In this case, when the corner shelf body 70 is mounted to the shelf support, the protrusion 77 arranged at the inner edge of the cavity 25 of the corner shelf body is positioned inside the engaging region 80, and the shelf body is smoothly mounted according to the conditions of the corner wall. In addition, when the corner shelf body 70 is mounted on the V-shaped shelf support, the protrusion 77 at the cavity of the corner shelf body is in contact with the fall prevention part 6 of the V-shaped shelf support. For the corner shelf body of Example 3, a polypropylene resin is used.

Since the fall prevention part 6 comprises a shelf body-guiding surface 6a which is slanted upward to guide the upper part of the inner wall of the shelf body in the cavity of the shelf body, it is possible to mount the shelf body smoothly to the shelf support when the corner shelf body 70 is mounted to the V-shaped shelf support whose two fixing parts are fixed on the corner wall.

Now, an example of the way to mount the corner shelf assembly 300 shown in FIGs. 22A and 22B will be described. First, a pair of fixing parts 3 of the V-shaped shelf support 13 is fixed onto a corner wall (not shown) using nails, screws, or the like. By doing so,

the fall prevention part 6 of the shelf support is fixed on the corner wall in a way that it projects at the corner portion of the corner wall forming an engaging region 80. Then, the cavity 25 of the corner shelf body is mounted to the V-shaped shelf support 13 in the direction indicated by the arrow in FIG. 22A. Since a protrusion<sup>77</sup> formed at the inner edge of the cavity of the corner shelf body 70 engages with the fall prevention part 6, it is possible to surely prevent the shelf body from falling off. In addition, since the V-shaped shelf support 13 can freely change the angle  $\theta$ , which is formed by the two fixing parts, even if a desired spot is one of corner walls having various shapes and angles, the shelf support can be mounted easily without a gap by adjusting the angle of the two fixing parts. Further, as shown in FIG. 22B, since the V-shaped shelf support 13 is entirely encased in the cavity 25 of the corner shelf body when the shelf body is mounted, the shelf support is not seen from the outside and therefore the corner shelf assembly can be mounted easily on the wall with excellent aesthetics and design.

Several examples of the shelf assembly, shelf body, and shelf support of the present invention have been described in detail. However, it should be understood that the scope of the present invention is not limited by these examples and various changes can be made within the scope of the present invention.

According to the present invention, it is possible to provide a shelf assembly which can be mounted as a unit to a desired spot such as a wall, corner wall, or the like, and which is excellent in stability, cohesiveness, fall prevention, aesthetics, design, and the like.